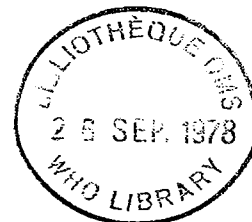




SMALLPOX ERADICATION IN THAILAND

Ministry of Public Health  
 Government of Thailand

World Health Organization



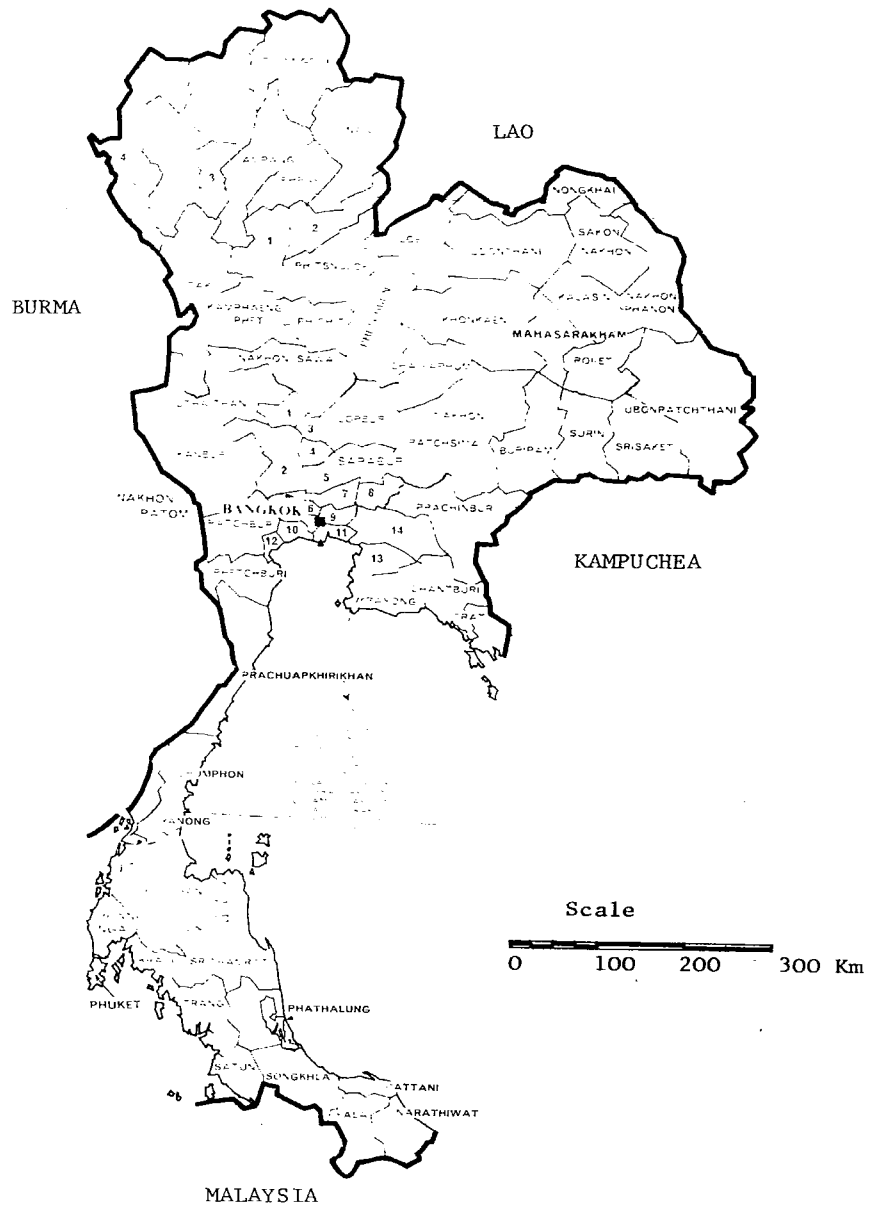
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MAP OF THAILAND SHOWING PROVINCES



## 1. BACKGROUND INFORMATION

### 1.1 Geography

The Kingdom of Thailand, formerly Siam, is bordered by Burma and the Andaman Sea to the west, Lao and Democratic Kampuchea to the east, Burma and Lao to the north, and Malaysia and the Gulf of Thailand to the south. Thailand is divided by natural barriers into four geographical regions with distinct economic, social and political characteristics. The four regions are: central (plain and low land), northern (hilly), north-east (plateau) and southern (peninsula). Their population density, economic activity and accessibility differ significantly.

### 1.2 Climate

Thailand is a tropical country with a high degree of humidity. There are three seasons: the hot, dry period from March to May, the rainy season from June to October and the cold season from November to February. During the cold season, the temperature rarely drops below 10°C. During the rainy season, about 127 centimetres of rain fall in Thailand. The southern region gets rain the year round, while the north-east region has a semi-arid climate.

### 1.3 Demography

The last census was carried out in 1970. The estimated 1976 population of Thailand was 43.57 million, living in 514 000 square kilometres, giving a population density of 84.7 persons per square kilometre. The population density varies in different regions, being 108 persons per square kilometre in the central region and 46 persons per square kilometre in northern Thailand. Eighty-four per cent. of people live in rural areas and 16% in urban areas. In 1976, the crude birth rate was estimated at 35.0 per 1000, the crude death rate at 9.0 per 1000, with a resulting natural growth rate of 2.6%. The age distribution of the population is characterized by a high proportion of people in the younger age-groups (44.7% below 15 years).

### 1.4 Religion

Ninety-five per cent. of the population are Buddhists. The order of Buddhist monks remains a major social institution. Four per cent. of the population, mostly of Malay origin, are Moslem and live near the southern border. About 1% of Thai people belong to tribal groups living in the mountains near the northern boundaries. Of the non-Thai groups, only the immigrants from the Indian sub-continent and remnants of the Negritoid Semang in the southern region are easily distinguishable from the Thai. Chinese form the largest minority.

### 1.5 Socioeconomic status

Thailand has a strong economy that has placed it in the group of developing countries which have reached the stage of economic "take-off". It is commonly known as the granary of south-east Asia and also exports rubber, teak, jute, tin, and light industrial products. The agricultural sector accounts for approximately 29% of the gross national product, is predominantly labour intensive and accounts for about 80% of the working population. Rice is the principal crop and staple food.

### 1.6 Education

The literacy rates for the country as a whole are 89% for males and 75% for females. Seven years of education for every child was made compulsory in 1960; however, inequality in educational opportunity still exists in some regions. Secondary education lasts five years and most university courses four years. The Bureau of State Universities is responsible for academic training, including that of health manpower. There are 11 universities and seven medical schools in Thailand and several institutions for the training of paramedicals including practical nurses, midwives, nurses, sanitarians, laboratory technicians and pharmacists. Education and official work are conducted in Thai, the national language.

## 1.7 Transport

Transportation services in Thailand are very efficient. The State Railway of Thailand has four trunk routes which take passengers to various parts of the country. The southern route connects with Malaysia Railways, forming an international express. The urban and inter-urban bus services have improved in recent years. Traditional water transport is widely used by the people. There is both international shipping and a domestic coastal service. The domestic airline flies from Bangkok to all important cities, 17 in number, in Thailand. Bangkok airport (Don Muang) is one of the most modern airports in south-east Asia, and is used by most international airlines.

## 1.8 Movement of population

Population movement from rural areas to Bangkok and to mining provinces in the south has been observed during recent years. The main seasonal movement of population occurs in summer from the north-east region to the central region, because of drought conditions and low soil fertility. Around mid-April large numbers of people, mainly from Bangkok, travel to the north-east provinces, especially Chiang Mai, for annual festivals. External migration occurs in the border provinces; labourers from Burma are employed in the southern mining provinces, and refugees from Lao, Viet Nam and Democratic Kampuchea occasionally take shelter in north-east provinces.

## 2. ADMINISTRATIVE STRUCTURE

### 2.1 Civil administration

Thailand is divided into 71 provinces (changwat), Bangkok Metropolis Area and 126 municipalities. Each province is headed by a governor who is appointed by the Ministry of Interior. The Bangkok Metropolis is headed by one governor and four deputies. Each of the municipalities is headed by a mayor who is selected by the Municipal Council (members are elected by the people). The second ranking city, Chiang Mai, has a population of 100 837. The average population of other municipalities is 10 000.

The typical province has a population of about 500 000 and the smallest well over 100 000. Each province is composed of from three to 20 districts (amphoes) depending on population and area. There are 565 amphoes and 72 smaller districts (king amphoes). Each district is administered by a district officer, a civil servant appointed by the Interior Ministry, who is responsible to the provincial governor. Each smaller district is under the supervision of a deputy district officer responsible to the district officer.

There are 5465 sub-districts (tambons) and 49 347 villages (mubans). A tambon consists of a group of villages. The tambon head official acts as registrar and as intermediary between the district officer and village headman. The village is the smallest administrative unit usually consisting of about 50 households, having about 200 inhabitants, and headed by a village headman (puyaiban) elected by the villagers.

### 2.2 Public health structure (refer to Annex 1)

The Ministry of Public Health has the responsibility for the organization and administration of public health services and most of the medical services of the Government. The Ministry is organized into six major components:

(a) The Office of the Under-Secretary of State for Public Health has 18 divisions, and coordinates the work of the five departments. In addition, it directly supervises and controls the Provincial Health Administration which is headed by a Provincial Health Officer in each of the 71 provinces.

(b) The Department of Medical Services provides part of the medical care to Bangkok Metropolis and psychiatric services for the whole country.

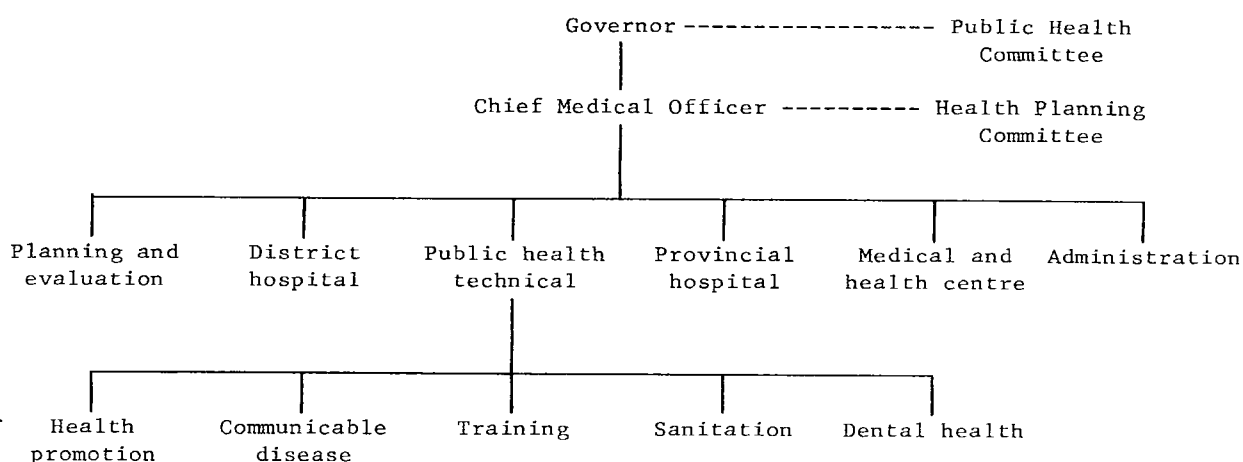
- (c) The Department of Health has eight technical divisions dealing with dental health, rural water supply, environmental health, sanitation, nutrition, family health, school health and occupational health.
- (d) The Department of Communicable Disease Control has six technical divisions dealing with VD control, malaria, general communicable disease control, filariasis control, leprosy control and TB control. In addition, it is also in charge of the Bamrasnaradura Infectious Diseases Hospital, the Leprosy Hospital and the Chest Hospital.
- (e) The Department of Medical Sciences has nine technical laboratories: radiation protection service, clinical pathology, toxicology, drug analysis, food and beverage analysis, medical research, medical entomology and the Virus Research Institute.
- (f) The Office of Food and Drug Committees has five divisions dealing with cosmetic control, psychotropic substance control and food and beverage control.

All the departments give technical support to the provincial health offices in their respective fields. Health services in the Bangkok Metropolis Area and the 126 municipalities are administered through Health Sections of the Ministry of Interior. The Government Pharmaceuticals Organization is concerned with the production of pharmaceuticals and biologicals and supplies nearly half of the material used by the government hospitals. Health services are provided by both the public and private sectors, the latter concentrating on curative medicine. Bangkok Metropolis has a high concentration of health facilities and manpower.

### 2.3 Provincial health service

The provincial health care services have been designed by the Ministry of Public Health to deal as efficiently as possible with the rural population. In addition to the provincial hospital, the administration looks after preventive, curative and promotive health services in the province through an administration based in the province headquarters.

FIG. 1. PROVINCIAL HEALTH ADMINISTRATION



### 2.4 District health service

Each province has three to 20 districts (amphoes), the population of which varies from 10 000 to 100 000. Out of 565 districts, only 255 have a hospital (medical and health centre) with at least 10 beds. The rest of the districts are served by health centres staffed by nurses and sanitarians. Each district, on average, has 10 sub-districts (tambons). Out of 5465 sub-districts, 3500 are covered by health centres. One thousand four hundred and fifty

midwifery clinics serve the uncovered tambons. There is a schedule for periodic visits of mobile teams to remote areas of various districts and tambons. Recently a primary health care scheme is being developed in Thailand, by organizing village health volunteers.

## 2.5 Organization of smallpox eradication programme

There was no special organization for implementing smallpox eradication activities. The Chief of the Division of Communicable Disease Control coordinated the project at national level. The vaccinations were performed by sanitarians, midwives, nurses and other health auxiliary personnel. The yaws eradication staff and BCG staff cooperated with these health personnel in carrying out the vaccination campaign. The local health workers were trained to be vaccinators by the staff of the Communicable Disease Division. In the municipal areas, the vaccinations were done by the municipal health authorities in cooperation with provincial health officers.

Diagnostic support through laboratory investigation was provided by the Virus Research Institute, Bangkok, in case of atypical chickenpox or suspect smallpox cases. The Infectious Diseases Hospital near Bangkok admitted severe eruptive fever cases from neighbouring provinces. Freeze-dried smallpox vaccine is produced by the Government Pharmaceutical Organization. With the development of the Epidemiology Division, notification and investigation of communicable diseases including smallpox have further improved.

## 3. HISTORY OF SMALLPOX ERADICATION

Smallpox had been present in Thailand for hundreds of years. Its incidence and the fact that many outbreaks resulted from importations are discussed in section 5.

### 3.1 Chronology of events

The chronological sequence of important events in the progress toward elimination of smallpox foci in the country was as follows:

- 1905 - Lymph vaccine production started at Nakhon Pathom province. Later, it was taken up by the Red Cross Pasteur Institute.
- 1913 - Smallpox vaccination made compulsory by law.
- 1960 - UNICEF provided assistance to produce freeze-dried smallpox vaccine.
- 1961 - Thai Department of Health started a three-year smallpox eradication programme.
- 1974 - Bifurcated needle for vaccination was introduced.

### 3.2 Mass vaccination

In accordance with the decisions of the Eleventh World Health Assembly (1958) and of the Regional Committee of SEARO (1960), Thailand implemented a smallpox eradication programme in 1961. The objective was to vaccinate at least 80% of the population. The plan of operations called for vaccination of about eight million people annually for three consecutive years. It was found that the number of vaccinations performed was below this target and so the Department of Health extended the programme to five years. From 1961 to 1965, 42.93 million vaccinations were performed, of which 23.01 million were primary vaccinations. The aim of the programme was thus attained.

### 3.3 Maintenance phase

The next phase of the programme was the maintenance of immunity of the population to smallpox, so as to prevent an epidemic as a result of smallpox importation. Regular vaccination was planned among the following groups:

- (i) the newborn, estimated to be approximately one million a year;
- (ii) the population in the border districts, estimated to be seven million. About 2.5 million people were to be vaccinated each year in the border areas;
- (iii) children at the time of school entry and in the last year before leaving school;
- (iv) any person enlisted for military service.

The number of smallpox vaccinations during the maintenance phase was anticipated to be about four to six million a year.

#### 4. SMALLPOX VACCINATION

##### 4.1 Vaccination policy

Variolation was unsuccessfully attempted by court physicians in 1838 and successfully by American missionary doctors two years later. Variolation is now prohibited by law. Primary smallpox vaccination became compulsory by law in 1913. In the early days of the legislation, it was enforced among children of two age-groups: under six months of age and at school entrance. Except during epidemics, the law has not been strictly enforced during the last two decades.

##### 4.2 Vaccine

Freeze-dried smallpox vaccine has been produced in the country since 1960. Before that, the vaccine demand was met by the local production of liquid or glycerinated lymph vaccine which had been in existence as far back as 1905 and was always sufficient for local use. The freeze-dried vaccine produced by the Government Pharmaceutical Organization is sufficient to meet the requirements of the country. The production during the last three years was as follows:

<u>Year</u>	<u>Vaccine doses</u>
1975	4 173 350
1976	4 786 750
1977	4 849 800

##### 4.3 Vaccine distribution and storage

All vaccine is continuously stored below 8°C at the central depot of the Department of Communicable Disease Control. It is then transported to the provinces three or four times a year. Although unrefrigerated during transportation, it is not left at room temperature for more than 30 days. The vaccine is mostly stored in the provincial health offices' refrigerators and transported to districts by the returning district officers who come to the provincial health offices for monthly meetings. The vaccine is stored at the district health centres in refrigerators, usually for one or two months before the scheduled vaccination session.

##### 4.4 Vaccination techniques

Scarification was used until 1974, when the currently used bifurcated needle was introduced. Water is used to clean the skin and the needles are sterilized by boiling.

##### 4.5 Organization of vaccination delivery

Provincial or municipal health personnel manning rural or urban health centres and midwifery clinics, namely sanitarians, nurses, midwives and auxiliary personnel have been assigned vaccination work as a part of their regular function. In rural areas, vaccination

is mainly performed during house-to-house visits or at appointed places in the community, with the use of the list of children born within the previous two months. In urban areas, vaccination is mostly done to a fixed schedule at the health centres or hospitals. About 6000 personnel are engaged in vaccination activity. Since 1977, smallpox vaccine has been included as one of the antigens in the Expanded Programme on Immunization.

Vaccination performance is recorded for individuals with their age and address and the data are summarized in the monthly report collected from the district and sent by the provincial health office to the Ministry of Public Health, to be reviewed by the Department of Communicable Disease Control.

Inspection after seven days of about 1% of those vaccinated, to determine take rates, was carried out during the Smallpox Eradication Campaign 1961-1965. This inspection is now not usually practised.

#### 4.6 Vaccination performance and reporting

From each health facility, a monthly report indicating main activities is submitted to the district health officer. There is a proforma for submission of the report, which includes information on smallpox vaccination. The district health officer makes a consolidated report and sends it to the district officer, who in turn despatches it to the provincial governor. The provincial chief medical officer gets a copy of the report and presents the main findings in the progress chart maintained in his office. In all health facilities, midwifery stations, health centres, medical and health centres and hospitals, charts are maintained showing the progress in the main aspects of the health programme. An annual report is published by each provincial health office. The vaccination performance report of the country is edited by the Department of Communicable Disease.

The total vaccination performance from 1951 to 1977 can be seen in Fig. 2. The high figures from 1961 to 1965 were due to the mass campaign carried out as a part of the smallpox eradication programme. The 7.5 million vaccinations performed in 1959, a high number compared to other years, were a response to large smallpox epidemics in that year. From 1977, revaccination has not been carried out. Primary vaccination in the years 1973-1977 covered 5.5-9.9% of the population (cf. crude birth rate of 3.5%) (Fig. 3).

FIG. 2. TOTAL SMALLPOX VACCINATIONS PERFORMED ANNUALLY 1951-1977

Year	Total vaccinations in millions	Year	Total vaccinations in millions
1951	1.96	1965	7.73
1952	2.05	1966	2.76
1953	4.27	1967	2.75
1954	2.80	1968	4.69
1955	2.92	1969	5.42
1956	2.11	1970	4.62
1957	1.38	1971	5.42
1958	4.54	1972	5.31
1959	7.51	1973	6.39
1960	4.15	1974	4.21
1961	6.95	1975	4.48
1962	10.48	1976	4.16
1963	12.84	1977	2.36
1964	4.93		



FIG. 3. SMALLPOX VACCINATION 1973-1977

Year	Primary vaccination	Revaccination	Percentage of population covered by primary vaccination
1973	3 740 930	2 649 064	9.9
1974	2 263 855	1 947 195	5.5
1975	2 435 278	2 049 272	6.1
1976	2 505 083	1 653 207	6.1
1977	2 355 074	-	5.5

#### 4.7 Vaccination scar survey

Scar surveys were carried out by national health staff in different provinces during 1968 and 1969. Results are shown in Fig. 4.

FIG. 4. RESULTS OF SCAR SURVEY CONDUCTED BY NATIONAL HEALTH STAFF 1968-1969

Age-group	No. examined	No. unprotected	Percentage unprotected
Less than 1 year	1 995	1 647	82.5
1-4 years	10 474	5 181	49.4
5-14 years	20 152	3 809	18.9

WHO carried out a national scar survey in areas selected by random sampling, at various stages in November 1969 (Fig. 5). Assuming that the sample was representative of the whole population in Thailand, it was calculated that some five million children out of almost 15 million in the 0-14 year age-group were unprotected. In other words, one out of every three children had never been successfully vaccinated. Of the total number of unprotected children, 73% were found in the 0-4 age-group (19% among infants less than one year old and 54% in the 1-4 year age-group). In the 5-14 year age-group, a reasonably low proportion of children remained unprotected.

FIG. 5. WHO ESTIMATE OF THE NUMBER OF UNPROTECTED CHILDREN, NOVEMBER 1969

Age-group	Population in thousands	Unprotected children in thousands	Percentage unprotected
Less than 1 year	1 175	975	83
1-4 years	4 458	2 764	62
5-14 years	9 297	1 395	15
All	14 930	5 134	34

A facial pockmark survey was conducted simultaneously and, in the sample, no child with pockmarks was found. This was in line with the fact that Thailand had reported no smallpox since 1962.

From 1970 to 1972 a vaccination scar survey for BCG and smallpox vaccination was conducted in 25 of the 72 provinces by the BCG Assessment Team of the TB Control Division. A 5% cluster sample, obtained by drawing lots, was used to select children 0-14 years old for examination. Two hundred and eight thousand three hundred were examined (92% of the children registered in the sample) and the results are shown in Fig. 6.

FIG. 6. RESULTS OF VACCINATION SCAR SURVEY 1970-1972

Age-group	Percentage of children with vaccination scar
0-1	32.8
2-7	67.6
8-14	90.6

During 1975-1976 about nine provinces were surveyed, using the same techniques and the results are shown in Fig. 7.

FIG. 7. RESULTS OF VACCINATION SCAR SURVEY 1975-1976

Age-group	Percentage of children with vaccination scar
0-4	35.60
5-9	60.80
10-14	80.94

#### 4.8 Complications of vaccination

Some doctors at a medical school hospital and some maternal and child health centres mentioned that there had been a few cases of local reaction when vaccination was given at birth, which resulted in their abandoning smallpox vaccination in the newborn. No written report or precise statistics on complications are available.

#### 4.9 Cultural and religious resistance to vaccination

In general there is no cultural or religious resistance to vaccination except that in the few southernmost provinces, with the majority of the population of Islamic faith, it was more difficult to gain cooperation. Difficulties were also experienced in carrying out vaccination among the nomadic population (about 300 000) and in the hilly areas inhabited by tribal people.

### 5. EPIDEMIOLOGY OF SMALLPOX

#### 5.1 Epidemics

In Thailand, smallpox had been historically endemic. Since 1920, smallpox was reported every year without any regular periodicity. The extreme variability in reported incidence is shown in Figs 8 and 9. The smallpox outbreak in 1923 in which 1636 cases and 705 deaths

occurred was caused by imported cases arriving by sea from South China. The greatest smallpox epidemics occurred after the Second World War during 1945 and 1946. The epidemics resulted from infection introduced by war prisoners brought to Thailand by the Japanese forces. The disease spread to many provinces of the country. In 1945, 36 394 cases with 8606 deaths (2.4 cases per 1000 population) and, in the next year, 26 443 cases with 7015 deaths (1.7 cases per 1000 population) were recorded. The high transmission rate also continued during 1947, with 1314 cases with 301 deaths.

Several smallpox epidemics occurring in southern Thailand have resulted from infection introduced by Moslem pilgrims returning from Saudi Arabia. The most important example is the large-scale outbreak of 1959 which started in Narathiwat Province and spread to six more provinces. The transmission continued into 1960 in Trang Province.

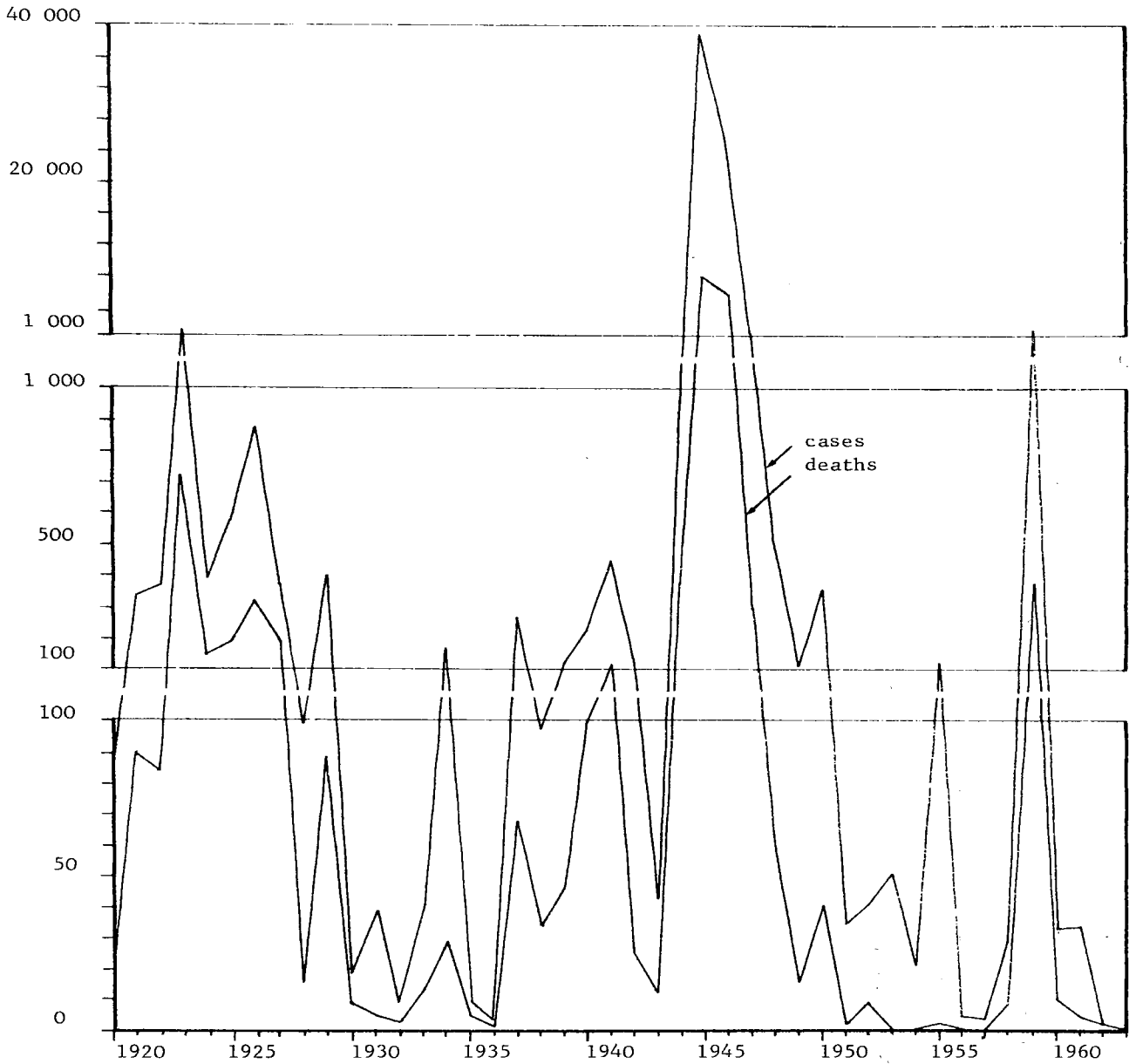
In 1961, an outbreak was reported from an isolated village adjacent to the Northern Shan State of Burma in Maesai District, Chiangrai Province. Infection was introduced by a boy who made frequent trips to Shan State (Burma) with his parents before he became ill. There was a delay in reporting of this outbreak and information was received by health authorities during the third generation of transmission. The infection continued until January 1962 with 34 cases and five deaths (one case and one death in 1962). No smallpox case has been reported since 1962.

FIG. 8. REPORTED SMALLPOX CASES AND DEATHS 1920-1962

Year	Case	Death	Case-fatality rate	Year	Case	Death	Case-fatality rate
1920	89	27	30.3	1942	133	26	19.5
1921	337	90	26.7	1943	44	16	36.3
1922	367	84	22.8	1944	925	376	40.6
1923	1 635	705	43.1	1945	36 394	8 606	23.6
1924	383	142	37.0	1946	25 443	7 015	26.5
1925	579	190	32.8	1947	1 314	301	22.8
1926	867	317	36.5	1948	514	58	11.2
1927	368	183	49.7	1949	107	16	14.9
1928	98	14	14.2	1950	348	41	11.7
1929	387	88	22.7	1951	34	2	5.8
1930	19	8	42.1	1952	43	9	20.9
1931	38	5	13.1	1953	50	0	0
1932	8	3	37.5	1954	21	0	0
1933	41	13	31.7	1955	117	2	1.7
1934	174	29	16.6	1956	4	0	0
1935	9	4	44.4	1957	3	0	0
1936	3	1	33.3	1958	28	7	25.0
1937	263	72	27.3	1959	1 548	272	16.9
1938	97	33	34.0	1960	32	11	34.0
1939	113	46	40.7	1961	33	4	12.1
1940	228	98	42.9	1962	2	2	100.0
1941	345	111	32.1				

No smallpox case has been reported after 1962.

FIG. 9. REPORTED SMALLPOX CASES AND DEATHS; THAILAND 1920-1962



## 5.2 Incidence

The incidence per 100 000 population and number of provinces reporting disease from 1948 to 1962 are given below in Fig. 10.

FIG. 10. SMALLPOX INCIDENCE FROM 1948 TO 1962

Year	Incidence per 100 000 population	No. of provinces reporting
1948	3.42	37
1949	0.71	8
1950	2.24	9
1951	0.18	6
1952	0.22	8
1953	0.26	5
1954	0.11	5
1955	0.59	2
1956	0.02	1
1957	0.01	1
1958	0.12	4
1959	6.40	7
1960	0.12	1
1961	0.12	2
1962	0.01	2

## 5.3 Mortality

Reported annual case-fatality rates ranged from 0 to 100%. Excluding these extremes, the rate varied from 1.7% in 1955 to 49.7% in 1927. The case-fatality rate was high before 1947 and showed a general decline after this year.

FIG. 11. CASE-FATALITY RATE 1920-1962

Period	Case	Death	Case-fatality rate
1920-1929	5 111	1 840	36.0
1930-1939	765	214	27.9
1940-1949	66 441	16 620	25.0
1950-1962	2 263	350	15.4

## 5.4 The last smallpox outbreak

The last known smallpox outbreak in Thailand was reported from Bangkok Province. It was a single case outbreak, with the infection imported from India. Mr Loric Yadao of Uttar Pradesh arrived at Bangkok from Calcutta by air on 5 September 1962. Mr Yadao had a vaccination certificate as required by international sanitary regulations. He travelled by van from the airport to Lard Prao village, Bang Kapi District, where his relatives were staying. On 10 September, a neighbour of Mr Yadao's house, suspecting some dangerous disease, informed the headman of the area. The headman informed the Ministry of Public Health. Dr P. Kurasol of the Epidemiological Division visited the house, suspected Mr Yadao was suffering from smallpox and arranged for his transfer by ambulance to the Infectious Diseases Hospital. The diagnosis of smallpox was confirmed. The patient died on 15 September.

This smallpox incident was considered a public health emergency and was publicized by radio and newspaper. The public cooperated by visiting health centres to be vaccinated. The area where Mr Yadao resided was followed up for detection of additional cases and intensive vaccination was carried out. A search for possible contacts (passengers in the van and aircraft) was made through public announcements in the press. No secondary cases were reported.

## 6. SURVEILLANCE OF COMMUNICABLE DISEASES

### 6.1 Reporting system

The surveillance network which covers the whole country is administered by a strong central unit (Epidemiology Division) operating through four regional units. The Epidemiology Division is one of the 18 divisions located in the office of the Under-Secretary of State for Public Health (Planning and Evaluation Unit). The division is headed by a director, who is assisted by the chiefs of units including disease investigation, study and research, evaluation, training and public relations, and records. There are four regional epidemiological offices with a medical officer and several sanitarians. Their main duties are supervision and guidance of the epidemiological workers posted at the health information centre of each provincial health office. Every year, a three-day training course of epidemiological workers is arranged which is attended by senior officers of the Ministry of Public Health.

There are seven infectious diseases which must be reported immediately by the village headman, medical officer or health staff to the district health office which, in turn, reports to the provincial office. The village headman is paid an honorarium by the Government for registration of births and deaths and other activities including disease reporting. The provincial health office informs the Division of Communicable Disease by cable or radio. The seven infectious diseases requiring immediate notification are:

- (1) Plague
- (2) Smallpox
- (3) Yellow fever
- (4) Cholera
- (5) Meningococcal meningitis
- (6) Typhus fever
- (7) Relapsing fever.

There are 25 additional diseases or conditions, including chickenpox and measles, which are under surveillance and require notification (listed in Annex 2). For each case of a notifiable disease an "Individual Morbidity Card" (Annex 3) is completed and sent immediately to the Epidemiological Surveillance Division of the Ministry of Public Health. Investigation findings and final diagnosis are included in the individual case cards eventually sent to the same division, which compiles all disease notifications for detailed analysis and feedback to the provinces. An annual report includes province-wise and month-wise disease incidence. This reporting system was introduced in 1970 and the number of notifications received annually has steadily increased (Fig. 12).

FIG. 12. NUMBER OF "INDIVIDUAL MORBIDITY CARDS"  
RECEIVED 1970-1977

Year	Total information received
1970	16 101
1971	38 547
1972	93 134
1973	124 981
1974	154 653
1975	213 354
1976	246 072
1977	357 312

Details from Individual Morbidity Cards are also included in a Weekly Epidemiological Report compiled at provincial level by an epidemiological worker. These reports are sent to one of the country's four regional epidemiological offices and a regional sanitarian investigates where indicated. The results of his investigation allow cross-checking with data compiled at provincial level.

Feedback from provincial to district level is via the monthly meeting of district health officers and the annual provincial report.

#### 6.2 Surveillance for rash-with-fever diseases

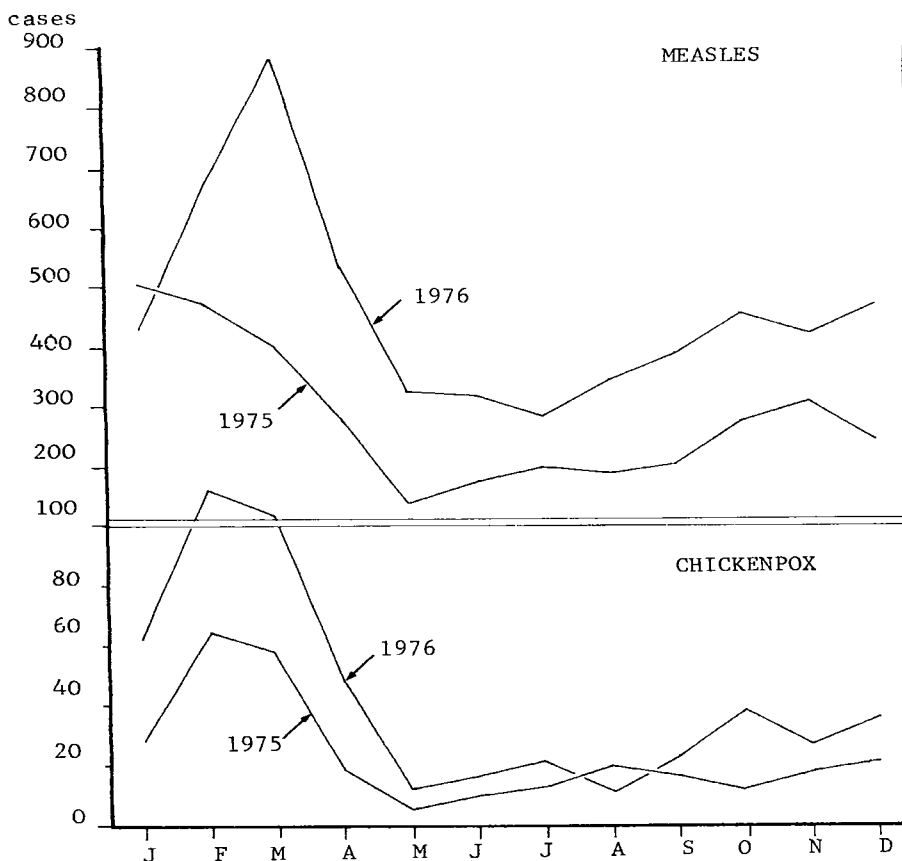
Since 1970 when chickenpox and measles started to be notified there has been an improvement in their notification, especially for measles (Fig. 13). In severe and atypical chickenpox cases, the diagnosis has been confirmed by laboratory testing.

FIG. 13. NOTIFIED CHICKENPOX AND MEASLES CASES  
DURING 1970-1977

Year	Chickenpox		Measles	
	Case	Death	Case	Death
1970	15	1	0	0
1971	41	0	274	0
1972	476	0	1 596	2
1973	88	0	2 910	5
1974	407	3	2 739	2
1975	275	3	3 392	4
1976	564	0	5 538	7
1977	795	0	8 749	4

The highest seasonal incidence of chickenpox was from February to March and of measles from October to April (Fig. 14).

FIG. 14. REPORTED MONTHLY INCIDENCE OF CHICKENPOX AND MEASLES 1975-1976



The reported numbers of cases of some principal infectious diseases in Thailand from 1975 to 1977, as presented in the Epidemiological Surveillance Report, can be seen in Annex 2.

### 6.3 Infectious Diseases Hospital

Bamrasnaradura Infectious Diseases Hospital is the only institution in the country which provides medical and nursing care exclusively for infectious diseases patients. At present it is located in Nonthaburi, very close to Bangkok city. The hospital is under the administration of the Department of Communicable Disease Control of the Ministry of Public Health. The main duties of the hospital are notification, isolation, quarantine, preliminary control, follow-up and disinfection service for dangerous infectious diseases. The hospital also has laboratory services for isolation of enteric bacteria, an out-patients department and an immunization service for children which includes smallpox vaccination.

All infectious diseases, which require isolation, quarantine and/or specialized treatment, are admitted to the hospital (Fig. 15). The cases are referred from various neighbouring provinces and Bangkok Metropolis Area. Adult chickenpox and erythema multiforme, for example, may cause difficulty in differentiation from smallpox; suspected cases are isolated and observed for development of further clinical manifestations. A second opinion of a medical officer and presence or otherwise of vaccination scar are considered and, in addition, specimens are collected from chickenpox cases (vesicular fluid or crusts) and sent to the virus laboratory for examination. In 1977, seven chickenpox cases were admitted and specimens were collected from six of them. No specimen was found positive for smallpox.



FIG. 15. CASES ADMITTED TO THE BAMRASNARADURA INFECTIOUS DISEASES HOSPITAL  
1972-1976

Case	1972	1973	1974	1975	1976
Chickenpox	13	16	11	4	10
Measles	39	106	43	43	68
Cholera	0	141	296	188	0
Paratyphoid	13	29	15	1	26
<u>V. parahaemolyticus</u>	302	345	432	300	389
<u>E. coli</u>	13	18	10	3	12
Food poisoning	28	44	16	11	6
Amoebic dysentery	3	4	3	4	23
Dysentery (unidentified)	98	105	38	85	126
Acute diarrhoea	2 063	2 777	2 165	2 074	2 043
Poliomyelitis	117	265	168	99	205
Rabies	42	44	35	60	59
Haemorrhagic fever	251	62	37	100	44

The last smallpox case in Thailand was admitted to the hospital on 10 September 1962 and died on 15 September. No smallpox case has been admitted to this hospital since that time.

#### 6.4 Surveillance in Bangkok Metropolis Area

Bangkok Metropolis Area has a population of 4.18 million and 70% of Thailand's urban population reside there. Although its administration, including health administration, comes under the jurisdiction of the Ministry of Interior, its Public Health Bureau works in close collaboration with various departments of the Ministry of Public Health.

The Director of the Communicable Disease Centre of Bangkok Metropolis is responsible for a disease surveillance programme and works closely with the Director of the Epidemiology Division of the Ministry of Public Health. In each of the city's 40 health centres there are two doctors and several nurses. The nurses are expected to pay home visits. Health volunteers communicate important information related to health to the nurses. The nurses consult a doctor for confirmation of a diagnosis if necessary. The Communicable Disease Centre reports each notifiable disease to the Epidemiology Division of the Ministry of Public Health and carries out joint investigation when required. If the hospitals or clinics come across a suspect smallpox case they immediately transfer or refer it to the Infectious Diseases Hospital. Among the chickenpox and measles cases reported during the past few years there have been no deaths.

FIG. 16. INCIDENCE OF CHICKENPOX AND MEASLES  
IN BANGKOK METROPOLIS AREA

Year	Number of chickenpox cases	Incidence per 100 000	Number of measles cases	Incidence per 100 000
1975	13	0.3	1 282	30.7
1976	36	0.8	1 632	37.2
1977	89	1.9	3 257	71.9

During the smallpox epidemic in Bangladesh, India and other Asian countries the following surveillance measures were in operation from 1971 to 1975:

- (i) At international ports of entry, travellers from countries with reported smallpox outbreaks were carefully inspected for valid vaccination certificates and vaccination scars. Those with vaccination scar were allowed entry, while those without were vaccinated and quarantined at the Infectious Diseases Hospital. Those with improper vaccination certificates were likewise quarantined until their departure or up to 14 days.
- (ii) Travellers from countries with smallpox outbreaks who developed fever and rash, even if in possession of a proper vaccination certificate, were isolated for further investigation at the Infectious Diseases Hospital.
- (iii) As there were quite a number of refugees from Bangladesh during 1972, they were all lodged at the Majestic Hotel for examination by health authorities during their transit stop in Bangkok. Those found with suspected symptoms were quarantined.

Primary vaccination of children is now stressed. In the hospitals and maternity homes, neonatal vaccination is carried out. Children attending the immunization clinics receive smallpox vaccination, and there is a programme to vaccinate unprotected children at school entry. Vaccinations performed in recent years by these services are shown in Fig. 17.

FIG. 17. VACCINATION PERFORMANCE IN BANGKOK METROPOLIS AREA\*  
1973-1977

Year	Primary vaccination		Revaccination
	Number	Percentage of total population	
1973	96 143	2.3	346 078
1974	54 202	1.3	136 397
1975	53 570	1.2	107 039
1976	60 174	1.4	33 220
1977	94 120	2.1	4 665

\* Immunization clinics and schools only.

#### 6.5 Surveillance by newspaper

Any report of a suspect smallpox case in Thailand gets special coverage in local newspapers pressing the health authorities to take necessary action. The police are also alert to the receipt of reports of death due to smallpox. Two incidents which have occurred during the last two months are mentioned below:

- (i) One 15-year-old male Thai, of Yannawa District, Bangkok Province, got a fever on 6 April 1978, developed a rash on 10 April and died on 13 April. The local doctor stated that smallpox as a cause of death should be excluded and relatives informed the police. The body was taken to the general hospital and the report got publicity in the newspaper. On receipt of information through the press, the Chief, Disease Investigation, Epidemiology Division, and the Director of the Virus Research Institute visited the hospital to conduct a detailed investigation. There was rash on the face and extremities consisting of petechial spots, without induration. A specimen (scrapings of the lesions) collected from the dead body for laboratory testing was found to be negative for smallpox. Drug rash was the final diagnosis.
- (ii) In March 1978, there was a newspaper report of six cases of suspect smallpox in Yaring District, Pattani Province. An epidemiological worker along with the provincial medical officer investigated the outbreak and found chickenpox. A specimen collected from the outbreak was found to be negative for smallpox.

In cases of difficulty in diagnosis at the provincial level, assistance is provided by the regional or national epidemiological office. In July 1977, a report of smallpox was received from Chawang District of Nakhon Srithammarat Province. The Chief, Regional Epidemiological Office assisted the Provincial Health Office in investigation of the outbreak including the collection of a specimen. The outbreak was confirmed to be due to chickenpox.

## 7. LABORATORY DIAGNOSIS

For more complete surveillance of the disease, specimens from suspected cases are submitted for laboratory investigations. The specimens are sent by the Infectious Diseases Hospital, the Epidemiology Division, and the provincial health offices. Diagnostic tests performed are virus isolation on chorioallantoic membrane of chick embryo and the gel precipitation test. No specimen has yielded smallpox virus after 1962. The tests are performed at the Virus Research Institute, Bangkok, under the administrative control of the Department of Medical Sciences. Though the Institute has an electron microscope, this has not been used for examination of the specimens received from atypical chickenpox or suspect smallpox cases. A specimen from the last smallpox case in Thailand was examined in this laboratory in September 1962 and confirmed the diagnosis of smallpox.

The laboratory destroyed its stock of variola virus in 1978.

FIG. 18. NUMBER OF SPECIMENS EXAMINED  
AT VIRUS RESEARCH INSTITUTE

Year	Total number of specimens examined	Number of specimens sent by I.D. Hospital
1968	14	7
1969	7	3
1970	30	8
1971	15	11
1972	24	13
1973	31	16
1974	21	11
1975	12	4
1976	12	10
1977	8	6
1978	7	3

From 1963 to 1967, specimens from 56 suspected patients admitted to the Infectious Diseases Hospital were sent for smallpox virus isolation; all proved negative. In 1974, specimens from two children who developed generalized reactions after vaccination were found to be positive for vaccinia virus.

## 8. INPUTS

The smallpox eradication programme has been part of the general health service and has utilized existing health staff. No special budgetary provision has been necessary. Freeze-dried smallpox vaccine is produced by the Government Pharmaceutical Organization and meets the country's requirements. The Department of Communicable Disease Control of the Ministry of Public Health has coordinated the smallpox eradication programme at national level. The department maintains a constant liaison with the Virus Research Institute of the Department of Medical Sciences, and the Epidemiology Division of the Planning and Evaluation Office. The programme was implemented in close collaboration with the World Health Organization, including Thailand's participation in intercountry seminars.

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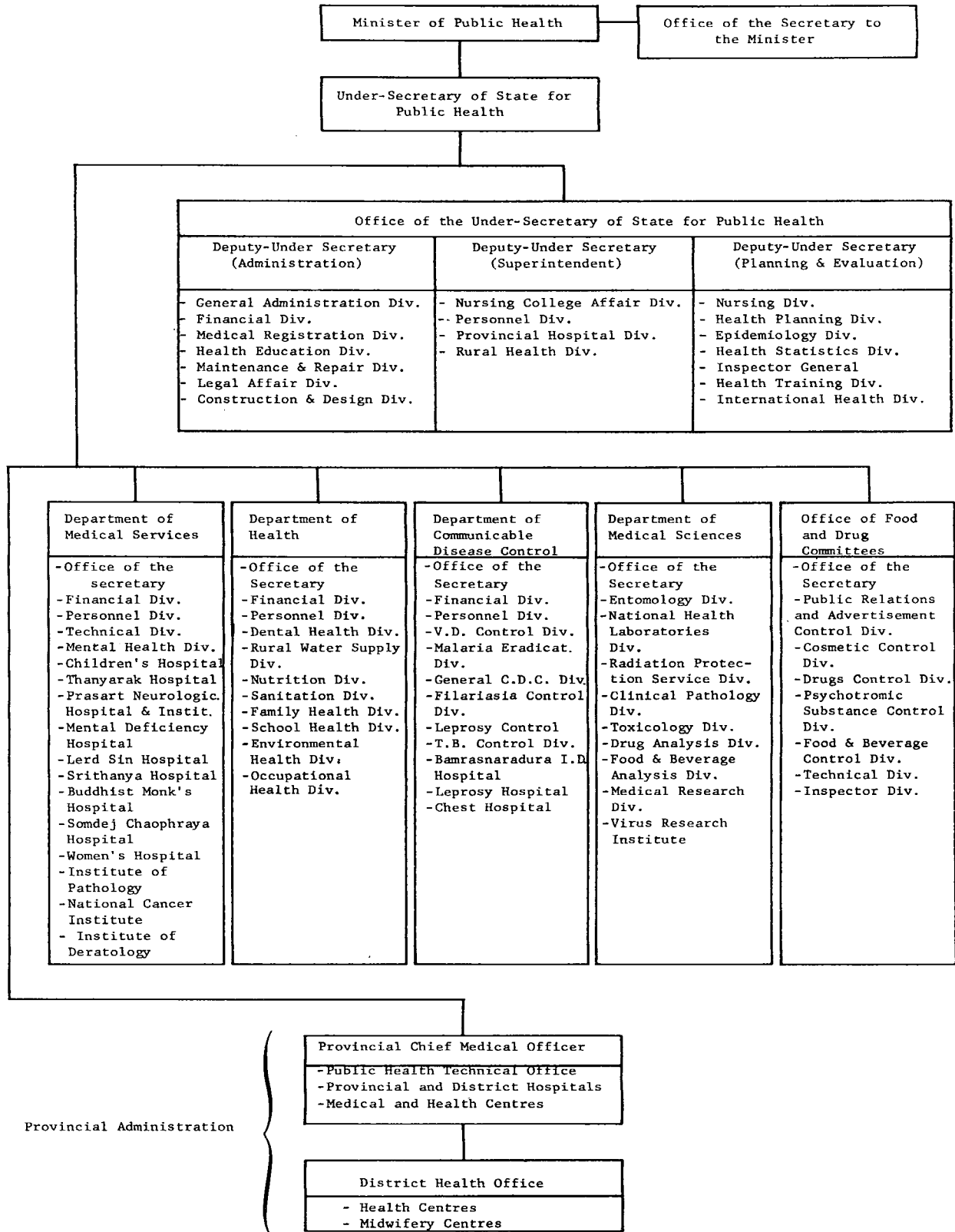
9. SELECTED BIBLIOGRAPHY

WHO Information Systems Development, Country Profile, Thailand, 1 October 1977

Keja, U. & Husbunrer Chinosoth (1970) Report on Scar Survey Conducted in Thailand (document  
SEA/Smallpox/35, 4.3)

Smallpox Eradication in Thailand, WHO Inter-Regional Seminar on Smallpox Eradication, Bangkok,  
1967

ORGANIZATION OF THE MINISTRY OF PUBLIC HEALTH



ANNEX 2

INCIDENCE OF PRINCIPAL DISEASES UNDER SURVEILLANCE  
FROM 1975 TO 1977

Disease	Number of cases		
	1975	1976	1977
1. Cholera	1 343	6	383
2. Acute diarrhoea	62 756	73 446	98 669
3. Bacillary dysentery	5 520	7 737	11 834
4. Amoebic dysentery	NA	197	566
5. Food poisoning	NA	1 802	5 915
6. Infectious hepatitis	5 913	6 824	9 875
7. Typhoid and paratyphoid fever	3 921	6 313	11 909
8. Poliomyelitis	440	800	875
9. Diphtheria	1 934	2 345	2 290
10. Pertussis	3 281	1 980	3 150
11. Tetanus	1 546	1 767	1 975
12. Dengue haemorrhagic fever	17 767	9 616	38 768
13. Encephalitis	1 622	1 559	1 752
14. Malaria	51 853	52 366	64 325
15. Scrub typhus	NA	93	58
16. Rabies	150	189	230
17. Meningococcal meningitis	NA	41	33
18. Pyrexia of unknown origin	32 366	42 619	64 613
19. Influenza	13 322	22 940	27 268
20. Rubella	NA	60	172
21. Pulmonary tuberculosis	NA	2 097	6 863
22. Leprosy	NA	86	425
23. Conjunctivitis	NA	1 062	1 752
24. Insecticide poisoning	NA	860	1 026

NA = Not available

<u>Individual Morbidity Card</u>		
<input type="checkbox"/> Smallpox <input type="checkbox"/> Cholera <input type="checkbox"/> Plague <input type="checkbox"/> Yellow Fever <input type="checkbox"/> Meningococcal Meningitis <input type="checkbox"/> Scrub Typhus <input type="checkbox"/> Dengue Haemorrhagic Fever <input type="checkbox"/> Diphtheria <input type="checkbox"/> Pertussis <input type="checkbox"/> Tetanus <input type="checkbox"/> Acute Diarrhoea <input type="checkbox"/> Food Poisoning <input type="checkbox"/> Enteric Fever <input type="checkbox"/> Typhoid Fever <input type="checkbox"/> Paratyphoid Fever	Dysentery <input type="checkbox"/> Bacillary <input type="checkbox"/> Amoebic <input type="checkbox"/> Unspecified <input type="checkbox"/> Amoebiasis (other organs) <input type="checkbox"/> Poliomyelitis Encephalitis <input type="checkbox"/> Japanese B <input type="checkbox"/> Post Infection <input type="checkbox"/> Post Vaccination <input type="checkbox"/> Unspecified <input type="checkbox"/> Rabies <input type="checkbox"/> Measles <input type="checkbox"/> Rubella <input type="checkbox"/> Chickenpox	<input type="checkbox"/> Influenza Hepatitis <input type="checkbox"/> Infectious, A. <input type="checkbox"/> Serum, B. <input type="checkbox"/> Unspecified <input type="checkbox"/> Infectious Yaws <input type="checkbox"/> Malaria <input type="checkbox"/> Leprosy Tuberculosis <input type="checkbox"/> Pulmonary <input type="checkbox"/> Other Systems <input type="checkbox"/> Pyrexia of Unknown origin <input type="checkbox"/> Conjunctivitis (epidemics) <input type="checkbox"/> Accidental Poisoning by Insecticide
Card Number..... Hospital Number ..... <u>Name of Patient</u> ..... Name of the parents (for child) ..... Date of birth ..... Age ..... years ..... months ..... days Sex <input type="checkbox"/> Male <input type="checkbox"/> Female <u>Nationality</u> <input type="checkbox"/> Thai <input type="checkbox"/> Chinese <input type="checkbox"/> Others ..... <u>Religion</u> <input type="checkbox"/> Buddhism <input type="checkbox"/> Moslem <input type="checkbox"/> Christian <input type="checkbox"/> Others ..... <u>Marital Status</u> <input type="checkbox"/> Single <input type="checkbox"/> Married <input type="checkbox"/> Separated <input type="checkbox"/> Divorced <input type="checkbox"/> Widow <u>Occupation</u> .....		
<u>Address of the Patient</u> House No. .... Lane ..... Street ..... Hamlet No. .... Name of Hamlet ..... Tambol ..... District ..... Province ..... <u>Municipality</u> <input type="checkbox"/> Inside <input type="checkbox"/> Outside		
Date of onset ..... Date of admitted ..... <u>Hospitalized</u> <input type="checkbox"/> In-patient <input type="checkbox"/> Hospital ..... <input type="checkbox"/> Out-patient <input type="checkbox"/> Health Centre ..... <input type="checkbox"/> Private Clinic ..... <input type="checkbox"/> Others .....		
<u>Condition of the patient</u> <input type="checkbox"/> improved <input type="checkbox"/> healed <input type="checkbox"/> escaped <input type="checkbox"/> dead <input type="checkbox"/> others ..... Date of death ..... Place of death .....		
Name of reporter ..... Position ..... Date ..... Office .....		